Claims

1. A rotary compressor comprising:

a driving shaft being rotatable clockwise and counterclockwise, and having an eccentric portion of a predetermined size;

a cylinder having a predetermined inner volume;

a roller installed rotatably on an outer circumference of the eccentric portion so as to contact an inner circumference of the cylinder, performing a rolling motion along the inner circumference and forming a fluid chamber to suck and compress fluid along with the inner circumference;

a vane installed elastically in the cylinder to contact the roller;

upper and lower bearings installed respectively in upper and lower portions of the cylinder, for rotatably supporting the driving shaft and hermetically sealing the inner volume;

suction and discharge ports communicating with the fluid chamber so as to suck and discharge the fluid;

a suction plenum communicating with the suction ports and preliminarily storing the fluid; and

a compression mechanism configured to form different sizes of compressive spaces in the fluid chamber depending on the rotational direction of the driving shaft, wherein the mechanism allows the compressor to have two different compression capacities in clockwise and counterclockwise directions.

2. The rotary compressor of claim 1, wherein the compression mechanism compresses the fluid using the overall fluid chamber when the driving shaft rotates in any one of the clockwise direction and the counterclockwise direction.

3. The rotary compressor of claim 1, wherein the compression mechanism compresses the fluid using a portion of the fluid chamber when the driving shaft rotates

in the other of the clockwise direction and the counterclockwise direction.

4. The rotary compressor of claim 1, wherein the suction ports are configured to suck the fluid in all the rotational directions of the driving shaft.

5. The rotary compressor of claim 1, wherein the discharge ports are configured to discharge the fluid which is introduced from a corresponding one of the suction ports and compressed while the driving shaft rotates clockwise or counterclockwise.

6. The rotary compressor of claim 1, wherein the suction ports are spaced apart by a predetermined angle from each other.

7. The rotary compressor of claim 1, wherein the discharge ports are spaced apart by a predetermined angle from each other.

8. The rotary compressor of claim 1, wherein each of the suction and discharge ports is at least two.

9. The rotary compressor of claim 1, wherein the compression mechanism comprises a valve assembly, which rotates according to the rotational direction of the driving shaft to selective open at least one of the suction ports.

10. The rotary compressor of claim 9, wherein the discharge ports comprise a first discharge port and a second discharge port which are positioned facing each other with respect to the vane.

11. The rotary compressor of claim 9, wherein the suction ports comprise a first suction port located in the vicinity of the vane and a second suction port spaced

apart by a predetermined angle from the first suction port.

12. The rotary compressor of claim 11, wherein the suction ports are circular.

13. The rotary compressor of claim 11, wherein the suction ports are rectangles.

14. The rotary compressor of claim 13, wherein the suction ports have a predetermined curvature.

15. The rotary compressor of claim 12, wherein the suction ports have diameters ranged from 6 mm to 15 mm.

16. The rotary compressor of claim 11, wherein the first suction port is positioned spaced by approximately 10° from the vane clockwise or counterclockwise.

17. The rotary compressor of claim 11, wherein the second suction port is positioned in a range of 90 - 180° from the vane to face the first suction port.

18. The rotary compressor of claim 9, further comprising discharge valves opening and closing the discharge ports so as to discharge the compressed fluid through the corresponding suction ports.

19. The rotary compressor of claim 9 or 11, wherein the valve assembly comprises:

a first valve installed rotatably between the cylinder and the bearing; and

a second valve for guiding a rotary motion of the first valve.

20. The rotary compressor of claim 19, wherein the first valve comprises a disc member contacting the eccentric portion of the driving shaft and rotating in the rotational direction of the driving shaft.

21. The rotary compressor of claim 20, wherein the first valve has a diameter larger than an inner diameter of the cylinder.

22. The rotary compressor of claim 20, wherein the first valve is 0.5 – 5 mm thick.

23. The rotary compressor of claim 19, wherein the first valve comprises:

a first opening communicating with the first suction port when the driving shaft rotates in any one of the clockwise direction and the counterclockwise direction; and

a second opening communicating with the second suction port when the driving shaft rotates in the other of the clockwise direction and the counterclockwise direction.

24. The rotary compressor of claim 19, wherein the first valve comprises a single opening communicating with the first suction port when the driving shaft rotates in any one of the clockwise direction and communicating with the second suction port when the driving shaft rotates in the other of the clockwise direction the counterclockwise direction.

25. The rotary compressor of claim 23, wherein the first opening and the second opening are circular or polygonal.

26. The rotary compressor of claim 23, wherein the first opening and the second opening are cut-away portions.

27. The rotary compressor of claim 23, wherein the first opening and the

second opening are rectangles each having a predetermined curvature.

28. The rotary compressor of claim 25, wherein the first opening and the second opening have diameters ranged from 6 mm to 15 mm.

29. The rotary compressor of claim 23, wherein the first opening and the second opening are positioned in the vicinity of the outer circumference of the first valve.

30. The rotary compressor of claim 19, wherein the first valve comprises a penetration hole into which the driving shaft is inserted.

31. The rotary compressor of claim 19, wherein the second valve is fixed between the cylinder and the bearing and comprises a site portion for accommodating the first valve.

32. The rotary compressor of claim 31, wherein the second valve has the same thickness as the first valve.

33. The rotary compressor of claim 23, wherein the suction port further comprises a third suction port positioned between the second suction port and the vane.

34. The rotary compressor of claim 33, wherein the third suction port is spaced apart by 10° clockwise or counterclockwise from the vane so as to face the first suction port.

35. The rotary compressor of claim 33, wherein the first valve further comprises a third opening for opening the third suction port simultaneously with opening the second suction port.

36. The rotary compressor of claim 33, wherein the first valve comprises a first opening for opening the third suction port simultaneously with opening the second suction port.

37. The rotary compressor of claim 19, wherein the valve assembly further comprises means for controlling a rotation angle of the first valve such that corresponding suction ports are opened accurately.

38. The rotary compressor of claim 37, wherein the control means comprises:

a curved groove formed at the first valve and having a predetermined length; and a stopper formed on the bearing and inserted into the curved groove.

39. The rotary compressor of claim 38, wherein the curved groove is positioned in the vicinity of a center of the first valve.

40. The rotary compressor of claim 38, wherein the stopper has the same thickness as the first valve.

41. The rotary compressor of claim 38, wherein the stopper has the same width as the curved groove.

42. The rotary compressor of claim 38, wherein the curved groove has an angle of 30 - 120° between both ends thereof.

43. The rotary compressor of claim 37, wherein the control means comprises:

a projection formed on the first valve and projecting in a radial direction of the

first valve; and

a groove formed on the second valve, for receiving the projection movably.

44. The rotary compressor of claim 37, wherein the control means comprises:

a projection formed on the second valve and projecting in a radial direction of the second valve; and

a groove formed on the first valve, for receiving the projection movably.

45. The rotary compressor of claim 37, wherein the control means comprises:

a projection formed on the second valve and projecting toward a center of the second valve; and

a cut-away portion formed on the first valve, for receiving the projection movably.

46. The rotary compressor of claim 45, wherein the projection and the cut-away portion form a clearance therebetween and the clearance opens the first suction port or the third suction port according to the rotational direction of the driving shaft.

47. The rotary compressor of claim 45, wherein the projection has an angle of 10 - 90° between both side surfaces thereof.

48. The rotary compressor of claim 45, wherein the cut-away portion has an angle of 30 - 120° between both ends thereof.

49. The rotary compressor of claim 1, wherein the compression mechanism comprises a valve assembly selective opening at least one of the suction ports spaced apart from each other by using a pressure difference between the cylinder and inner and

outer portions according to the rotational direction of the driving shaft.

50. The rotary compressor of claim 49, wherein the discharge ports comprise a first discharge port and a second discharge port which are positioned facing each other in the vicinity of the vane.

51. The rotary compressor of claim 49, wherein the suction ports comprise a first suction port located in the vicinity of the vane and a second suction port spaced apart by a predetermined angle from the first suction port.

52. The rotary compressor of claim 51, wherein the suction ports are circular.

53. The rotary compressor of claim 52, wherein the suction ports have diameters ranged from 6 mm to 15 mm.

54. The rotary compressor of claim 51, wherein the first suction port is positioned spaced apart by approximately 10° from the vane clockwise or counterclockwise.

55. The rotary compressor of claim 51, wherein the second suction port is positioned in a range of 90 - 180° from the vane to face the first suction port.

56. The rotary compressor of claim 49, further comprising discharge valves opening and closing the discharge ports so as to discharge the compressed fluid through the corresponding suction ports.

57. The rotary compressor of claim 49 or 51, wherein the valve assembly comprises:

a first valve installed rotatably between the cylinder and the bearing; and
a second valve for guiding a rotary motion of the first valve.

58. The rotary compressor of claim 57, wherein the first and second valves are configured to open the second suction port by an inner negative pressure of the cylinder.

59. The rotary compressor of claim 58, wherein the first and second valves are a check valve allowing only a flow of the fluid into the inside of the cylinder.

60. The rotary compressor of claim 58, wherein the first and second valves are a plate valve, which is deformed so as to open the suction port by a pressure difference.

61. The rotary compressor of claim 60, wherein the first and second valves are deformed so as to open the suction port in a direction which the negative pressure is generated.

62. The rotary compressor of claim 60, wherein a predetermined clearance is formed between the second valve and the second suction port.

63. The rotary compressor of claim 60, wherein the first and second valves further comprise a retainer to restrict deformation thereof.

64. The rotary compressor of claim 63, wherein the retainer is formed in the adjacent cylinder and the bearing, and is a groove configured to accommodate deformed valves.

65. The rotary compressor of claim 57, further comprises a third suction

port positioned between the second suction port and the vane.

66. The rotary compressor of claim 65, wherein the third suction port is spaced apart by 10° clockwise or counterclockwise from the vane so as to face the first suction port.

67. The rotary compressor of claim 66, wherein the valve assembly further comprises a third valve opening the third suction port simultaneously with opening of the second suction port.

68. The rotary compressor of claim 67, wherein the valve assembly a single plate member in which a plurality of plate valves are connected.

69. The rotary compressor of claim 68, wherein the single plate member comprises grooves forming the plate valves.

70. The rotary compressor of claim 68, wherein the single plate member comprises a penetration hole through which the driving shaft is inserted.

71. The rotary compressor of claim 1, wherein the compression mechanism is comprised of a first vane and a second vane that divide the fluid chamber into a first space configured such that the fluid is compressed while the driving shaft rotates bidirectionally, and a second space configured such that the fluid is compressed while the driving shaft rotates in any one direction.

72. The rotary compressor of claim 71, wherein the first and second vanes are spaced apart by a predetermined distance from each other.

73. The rotary compressor of claim 72, wherein the second vane is spaced

apart by 180° from the first vane.

74. The rotary compressor of claim 72, wherein the second vane is spaced apart by an angle less than 180° from the first vane clockwise or counterclockwise.

75. The rotary compressor of claim 71, wherein the suction and discharge ports supply or discharge the fluid into the first and second spaces selectively depending on the rotational direction of the driving shaft.

76. The rotary compressor of claim 75, wherein the suction and discharge ports are configured to suck the fluid into the first space in all the rotational directions of the driving shaft and discharge the compressed fluid from the first space.

77. The rotary compressor of claim 76, wherein the discharge ports are located communicating with the first space and comprises first and second discharge ports discharging the compressed fluid in each of the rotational directions of the driving shaft.

78. The rotary compressor of claim 77, wherein the first and second discharge ports are located in the vicinity of the vanes.

79. The rotary compressor of claim 78, wherein the first and second discharge ports are located facing each other.

80. The rotary compressor of claim 76, wherein the suction ports are located communicating with the first space and comprises first and second suction ports sucking the fluid to be compressed in each of the rotational directions of the driving shaft.

81. The rotary compressor of claim 80, wherein the first and second suction ports are located in the vicinity of the vanes.

82. The rotary compressor of claim 81, wherein the first and second suction ports are located facing each other.

83. The rotary compressor of claim 80, wherein the suction ports have diameters ranged from 6 mm to 15 mm.

84. The rotary compressor of claim 81, wherein the first suction port is positioned spaced by approximately 10° from the vane clockwise or counterclockwise.

85. The rotary compressor of claim 75, wherein the suction and discharge ports are configured to suck the fluid into the second space in any one of the rotational directions of the driving shaft and discharge the compressed fluid from the second space.

86. The rotary compressor of claim 85, wherein the discharge port comprises a third discharge port, which is located communicating with the second space and discharges the compressed fluid only in any one of the rotational directions of the driving shaft.

87. The rotary compressor of claim 86, wherein the third discharge port is located in the vicinity of one of the vanes.

88. The rotary compressor of claim 87, wherein the suction port comprises a third suction port, which is located communicating with the second space and sucks the fluid to be compressed only in any one of the rotational directions of the driving shaft.

89. The rotary compressor of claim 88, wherein the third suction port is located in the vicinity of one of the vanes.

90. The rotary compressor of claim 88, wherein the suction ports have diameters ranged from 6 mm to 15 mm.

91. The rotary compressor of claim 88, wherein the third suction port is positioned spaced apart by approximately 10° from the vanes clockwise or counterclockwise.

92. The rotary compressor of claim 88, wherein the third suction port is formed penetrating the cylinder.

93. The rotary compressor of claim 71, wherein the suction and discharge ports comprise suction and discharge valves that are selectively opened or closed depending on the rotational direction of the driving shaft.

94. The rotary compressor of claim 93, wherein the suction valves are configured to open the suction ports by an inner negative pressure of the cylinder.

95. The rotary compressor of claim 93, wherein the discharge valves are configured to open the discharge ports by an inner positive pressure of the cylinder.

96. The rotary compressor of claim 93, wherein the suction and discharge valves are a check valve allowing only a flow of the fluid into the inside of the cylinder.

97. The rotary compressor of claim 93, wherein the suction and discharge valves are a plate valve, which is deformed so as to open the suction port by a pressure difference.

98. The rotary compressor of claim 97, wherein the suction and discharge valves further comprise a retainer to restrict deformation thereof.

99. The rotary compressor of claim 98, wherein the retainer of the suction valve is formed in the adjacent cylinder and the bearing, and is a groove configured to accommodate deformed valves.

100. The rotary compressor of claim 1, wherein the compression mechanism is comprised of clearances formed differently according to the rotational direction of the driving shaft between the roller and the inner circumference of the cylinder.

101. The rotary compressor of claim 100, wherein the discharge ports comprise first and second discharge ports that respectively discharge the fluid compressed in each of the rotational directions of the driving shaft.

102. The rotary compressor of claim 101, wherein the first and second discharge ports are located in the vicinity of the vane.

103. The rotary compressor of claim 102, wherein the first and second discharge ports are located facing each other with respect to the vane.

104. The rotary compressor of claim 100, wherein the suction ports comprise first and second suction ports that respectively suck the fluid compressed in each of the rotational directions of the driving shaft.

105. The rotary compressor of claim 104, wherein the first and second suction ports are located in the vicinity of the vane.

106. The rotary compressor of claim 105, wherein the first and second suction ports are located facing each other with respect to the vane.

107. The rotary compressor of claim 106, wherein the suction ports have diameters ranged from 6 mm to 15 mm.

108. The rotary compressor of claim 105, wherein the first suction port is spaced apart by approximately 10° clockwise or counterclockwise from the vane.

109. The rotary compressor of claim 105, wherein the second suction port is spaced apart by approximately 10° clockwise or counterclockwise from the vane so as to face the first suction port.

110. The rotary compressor of claim 100, wherein the suction and discharge ports comprise suction and discharge valves, which are selectively opened or closed depending on the rotational direction of the driving shaft.

111. The rotary compressor of claim 110, wherein the suction valves are configured to open the suction ports by an inner negative pressure of the cylinder.

112. The rotary compressor of claim 110, wherein the discharge valves are configured to open the discharge ports by an inner positive pressure of the cylinder.

113. The rotary compressor of claim 110, wherein the suction and discharge valves are a check valve allowing only a flow of the fluid into the inside of the cylinder.

114. The rotary compressor of claim 110, wherein the suction and discharge valves are a plate valve, which is deformed so as to open the suction port by a pressure difference.

115. The rotary compressor of claim 114, wherein the suction and discharge valves further comprise a retainer to restrict deformation thereof.

116. The rotary compressor of claim 115, wherein the retainer of the suction valve is formed in the adjacent cylinder and the bearing, and is a groove configured to accommodate deformed valves.

117. The rotary compressor of claim 100, wherein the clearance is changed at a predetermined location of the cylinder.

118. The rotary compressor of claim 117, wherein the clearance is comprised of a first clearance, which is formed wide relatively at the predetermined location.

119. The rotary compressor of claim 118, wherein the first clearance is formed in the vicinity of one of the discharge ports.

120. The rotary compressor of claim 119, wherein the first clearance is located at positions of 60 - 90° clockwise or counterclockwise from the vane.

121. The rotary compressor of claim 118, wherein the first clearance is 90 – 100 μm.

122. The rotary compressor of claim 121, wherein the sum of the clearances at points of the cylinder facing each other is constant.

123. The rotary compressor of claim 122, wherein the sum of the first facing clearances formed at points facing the first clearance and second clearance is constant.

124. The rotary compressor of claim 123, wherein the first facing clearance is formed narrow relatively.

125. The rotary compressor of claim 124, wherein the first clearance is approximately five times greater than the first facing clearance.

126. The rotary compressor of claim 124, wherein the first facing clearance is 20 – 30 μm.

127. The rotary compressor of claim 118, wherein the clearance comprises a second clearance formed wider relatively and spaced apart by a predetermined angle from the first clearance.

128. The rotary compressor of claim 127, wherein the second clearance is located in an angle range of 150 - 180° from the vane.

129. The rotary compressor of claim 127, wherein the second clearance is approximately 90 – 100 μm.

130. The rotary compressor of claim 1, wherein the suction plenum accommodates oil separated from the stored fluid.

131. The rotary compressor of claim 1, wherein the suction plenum is installed at a lower portion of the bearing in the vicinity of the suction port.

132. The rotary compressor of claim 1, wherein the suction plenum has 100 - 400 % a volume as large as the fluid chamber.

133. The rotary compressor of claim 1, wherein the suction plenum is connected with a suction pipe through a predetermined fluid passage, the suction pipe supplying the fluid to be compressed.

134. The rotary compressor of claim 133, wherein the fluid passage penetrates the cylinder and the lower bearing.

135. The rotary compressor of claim 1, wherein the suction plenum further comprises a penetration hole through which a sleeve of the bearing passes.